Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

POCKELS ON THE DIFFERENTIAL EQUATION $\varDelta u + k^2u = 0$.*

Although this work might appear from its title, even to the mathematician or physicist, to have such a purely technical character as to make it of interest to a few specialists only, yet to one acquainted with the present condition of the mathematical sciences in Germany even the title-page will offer the promise of interest. A few introductory lines only are from the pen of Professor Klein, but the whole work is imbued with his ideas and methods. Professor Klein has distinguished himself in the past by work in many branches of pure mathematics; but up to the present time, with the exception of one small pamphlet, he has left the science of mathematical physics almost untouched in his published works. Breadth of view and largeness of conception are qualities which are too often sacrificed by the specialist in order that he may give greater thoroughness in details. For this reason the appearance of an outsider, as it were, in the field of mathematical physics should be looked upon by all interested in the real progress of this science as a rare piece of good fortune. For there is serious danger now threatening many branches of scientific study, that through too great specialization by small bodies of investigators they may become isolated from the rest of the scientific movement of the age. Just as the human race will degenerate wherever marriage takes place for several generations between the members of a few families only, so every little band of scientific specialists needs a constant intercourse with other investigators not so closely related to them in thought, if their work is not to become arid and comparatively worthless.

But if Professor Klein has turned his attention to mathematical physics during the last few years, it has not been for the purpose of enriching this branch of science with the methods and results of pure mathematics, although this will undoubtedly be the effect if physicists will come to meet him half way. On the contrary he has been moved by the desire of increasing his own power and that of all pure mathematicians who will stand by him, by making his own the methods of mathematical physics, so different in many respects from those of pure mathematics. The ideas he has here found come, in great part, from the English physicists: Maxwell, Thomson, Rayleigh, and would have repelled many pure mathematicians by their laxity of proof. They have in them however a strength which comes from their keeping in touch with the world of the senses, and which makes them of unequaled value to one seeking to discover new truths. In physics, equations appear at every step which no mathematician can solve ; but the observer of nature can often tell from what he sees going on before him some properties which the solutions of these equations must necessarily have. It is this principle which has been borrowed by Professor Klein from the English physicists, and which gives the work now under consideration an interest even to the student of pure mathematics.

---

* Ueber die partielle Differentialgleichung $\varDelta u + k^2u = 0$ und deren Auftreten in der mathematischen Physik, von Friedrich Pockels, mit einem Vorwort von F. Klein. Teubner. Leipzig, 1891

The equation $\Delta u + k^2u = 0$ is of almost paramount importance in physics, second in importance perhaps only to Laplace's equation $\Delta u = 0$, and Dr. Pockels considers its applications to all the different branches of physics in which it comes up, chief among these being the question of small vibrations of elastic bodies. The quickness with which he passes from one branch of physics to another, dwelling on none very long but returning frequently to each, is very characteristic of the book. In fact we have here, less an application of mathematical analysis to a physical problem, than the study of a single analytical subject from as many different physical points of view as possible; rather physical mathematics than mathematical physics.

The partial differential equation with which we are here concerned has, in the last decades, been the subject of numerous memoirs which are scattered through the mathematical journals of various countries. The main purpose of Dr. Pockels's book is to collect what is now known on the subject; but it is no mere compilation even aside from its not unimportant original contributions to the theory; for in it the old results are woven into a beautiful new fabric which will be a help to the reader and above all will enlarge his ideas. And it is not unimportant to insist upon this in these days when we have seen books written, as this one was, for the purpose of collecting the results in a modern branch of mathematics, which have been little more than the more or less direct reprint of papers by first one author and then another. There is a real need for books in the more modern branches of mathematics, but they must not be merely a patchwork of what can already be found as well elsewhere.

The application of physics to mathematics is the thought which runs through Dr. Pockels's whole book. It is even the cause of what seems to us to be an imperfection. The three dimensions of the space to which we seem unfortunately to be confined, have no analogy in pure analysis. It would have been possible to have indicated, at least to some extent, the extension of the results found to the case where the differential parameter Δ contains any number of variables instead of, at most, three. We may be sure that this would have been done if the work had proceeded directly from Professor Klein's pen. But Dr. Pockels is essentially a physicist and we ought perhaps to be satisfied with what he has given us, as he has often dwelt upon points which most physicists would have discarded as too purely mathematical.

MAXIME BÔCHER.